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clear that the immense amount of sweet secretion, or the honeyed fragrance, can serve any such purpose. The enormous number of flowers produced keep the bees busily engaged on one tree; and, as the use of pollen by flowers of one tree of pollen from the flowers of the same tree is not cross-fertilization, no benefit from that score is derived from insect visitors.

The use of the dried bract as a wing to aid in the distribution of the seed, can scarcely be the sole purpose. Most of the seeds, though many of the early ones are light, separate and fall to the ground before the common peduncle is detached. In many cases when detached it flies away with no seed. When it has one or more seeds developed, it does not go far, very little farther than the seed can be carried in a high wind without it.

But the lifting power of the growing bract is apparent, and though it is difficult to understand under modern views of evolution how the adaptations are of much use to the plant, it will, perhaps, be more difficult to believe that the adaptations have been made solely in the interest of the insect world, though, so far, the facts barely admit of any other interpretation.

My view is that nature has not made variety in structure and character solely for the peculiar advantage of the plant itself, but that a variety of purposes are involved. It would be absurd to say the various forms of plants have not, in general, a relation to individual good. Often they have none whatever; but they have a relation, at times wholly, to the general good in which the plant is then a mere incident in the purpose and at times they have but to create a variety for variety sake, which is a necessary element in the order of things.

THOS. MEEHAN.

### The "Bulblets" of *Lycopodium lucidulum*, Michx.

The description of *L. lucidulum* in Gray's Manual (ed. 1867, p. 673) closes with the statement, "Little bulblets form in the axils of the leaves of young shoots (*Austin, Rothrock*)."<sup>1</sup> The citation of authorities evidently implies that Gray had not seen these "bulblets" himself, and as I have failed to discover any mention of them elsewhere, even in the writings of Baker, Underwood and others who have made a special study of pteridophyta,

it seems fair to suppose that they are quite commonly wanting. I was, therefore, somewhat surprised to find them well developed in nearly every one of some twenty specimens which I collected on the 24th of last September in Western New York (Chautauqua County), a mile or so from the Pennsylvania line. And I was still more surprised to find, not only that Gray's statement regarding their "axillary" position is incorrect, but also that their structure is much more intricate and methodical than the term "bulblet" would suggest.

In each fully developed specimen the year's growth of stem—an inch or more in length—presented, below, the usual cluster of yellowish axillary sporangia, and, a little distance above, from one to four (more commonly two) six-bracted stipes, each terminated by a single "bulblet." These stipes are short, thickish subterete ascending branches, not axillary in any sense but occupying, side by side, the exact position of leaves.\* Each bears, close to the summit, two lateral pairs and one antero-posterior pair of bracts. The former (exterior and interior) are small, slender, pointed, triangular-lanceolate and curved-divergent like the open mandibles of an ant. The other (middle) pair is much larger and presents a bilabiate aspect, the upper bract being broad, flat, oblong and obtuse, the lower one channeled and curved (sigmoid-sulcate) and about twice the length of the upper. The four smaller bracts, though laterally inserted, are somewhat elevated, and the entire structure, upon casual observation, singularly resembles a short, stout peduncle, surmounted by a horizontal calyx with a five-toothed upper lip, the middle tooth broadest, and a much longer and narrower entire lower lip.

The "bulblet," which is borne upon this like the ovary of an apetalous pistillate flower, looks oddly like a small plump dustpan! The body of the "pan," which is horizontal inclining to cernuous in position, is formed of two broad oblong scales, sub-concave at base and placed closely side by side. A third scale,

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\* It is perfectly clear, from their form and function, that these stipes are caulomes. It is equally evident, from their position, that they are metamorphosed leaves. The necessary inference appears to be that the so-called "leaves" of *Lycopodium* are really caulin and not foliar,—branchlets and not leaves at all—a curious evidence (if any were needed) that the pteridophytic frond is altogether stem notwithstanding its foliaceous appearance.

oblong in shape, narrower, and with remarkably straight parallel edges, is fitted over the line between these, just as one roof-shingle covers the crack between the two below it. The acute tip of this is hooked downward and fits accurately into a notch between the two broader scales beneath. A short, slender, triangular-lanceolate scale covers the line between the two halves of the "pan" on the under side, and a corresponding but seemingly superfluous one above partly covers the base of the hook-tipped upper scale. Finally, the germ, for which all this complex arrangement of bracts and scales exists, is concealed within the base of the "pan," and consists of a minute axial protuberance, bearing four rudimentary lanceolate leaves, extremely small and yet visible to the naked eye upon careful dissection.

As to size, the stipe, the large anterior bract, and the bulblet itself are subequal in length, a scant quarter of an inch or somewhat less. The structure is entirely glabrous and of a uniform green color, not unlike that of the ordinary foliage of the plant.

Here, then, we have a stipe, six bracts, five scales and a germ—in all thirteen separate elements, completely differentiated, regularly combined and adapted to each other in the most systematic fashion. Six of these elements are in consimilar pairs; the other seven are unique, thus making ten distinct individual forms, or eleven if the stem and leaf components of the germ are reckoned as separate. The vocabulary of botany affords, apparently, no better name than "bulblet" for this complicated structure, but a brief consideration of it must enlarge materially our notion of what this modest term may signify. Perhaps no more curious mimicry of a flower has ever been recorded among the heterophyta.

When mature these curious "pans" separate readily from the stipe, and in the specimens collected a majority of them had already fallen. The stipes persist, however, with all their bracts, and those of previous years were readily detected down the stem, regularly accompanied by the equally persistent empty sporangia of the corresponding season. Unfortunately the bulblets were not noticed in the field, and I missed thereby the chance of detecting new plants springing from those that had fallen. Whether they take root at once or lie dormant till spring is still a matter of conjecture.

E. E. STERNS.